

**MACHINE
TRANSLATION OF
REFERENCE 3:
JP 2003-29848**

CLAIMS

[Claim(s)]

[Claim 1] A period which was provided with the following and when said pulse voltage has come out from source of said output transistor of a unit circuit (the N-2nd step unit circuit) of a beforehand stage of a unit circuit of eye N stage, When a charging transistor of each unit circuit is an N type transistor, Drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of the preceding paragraph on a High level. Drain voltage of an output transistor of said N stage unit circuit A Low level, When a charging transistor of each unit circuit is a P type transistor, drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of said preceding paragraph A Low level, A drive method of a signal transmission circuit, wherein a drain of an output transistor of said N stage unit circuit is a High level.

An output transistor which it comprises two or more unit circuits, and it is a drive method of a signal transmission circuit where pulse voltage is outputted one by one from said unit circuit according to a drive pulse, and said unit circuit inputs said drive pulse into a drain, and is outputted from source as said pulse voltage.

Bootstrap capacity connected between a gate of said output transistor, and source.

A charging transistor by which source was connected to a gate of said output transistor in order to charge said bootstrap capacity, and a drain was connected to a power source wire, an earthing conductor, or a charge pulse line.

[Claim 2]A drive method of the signal transmission circuit according to claim 1, wherein the same voltage as a drain of an output transistor of a unit circuit (the N+1st step unit circuit) of the next step is added to a drain of an output transistor of a unit circuit (the N-2nd step unit circuit) of said beforehand stage.

[Claim 3]On the same voltage V_a , drain voltage of an output transistor of a unit circuit (the N-2nd step unit circuit) of said beforehand stage and drain voltage of an output transistor of a unit circuit (the N+1st step unit circuit) of said next step.

On drain voltage and the voltage V_b with drain voltage of an output transistor of a unit circuit (the N+2nd step unit circuit) of a stage same one after another of an output transistor of said preceding paragraph. [of a unit circuit (the N-1st step unit circuit)] It is drain voltage and the voltage V_c with drain voltage same one after another of an output transistor of a **** unit circuit (the N+3rd step unit

circuit) of an output transistor of eye said N stage, [of a unit circuit] A drive method of the signal transmission circuit according to claim 1 or 2 whose drain of an output transistor is a three-phase drive of Va, Vb, and Vc.

[Claim 4]A drive method of the signal transmission circuit according to any one of claims 1 to 3 which is 0V when drain voltage of said charging transistor is a Low level.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention is used for the shift register for driving a liquid crystal display and an MOS type pickup device, and relates to the drive method of the signal transmission circuit which can be driven with the low voltage and low power consumption.

[0002]

[Description of the Prior Art]Drawing 3 is an example which shows the composition of the conventional signal transmission circuit. It is constituted by

the output transistor 1, the capacity 2 for a bootstrap, the capacity charging transistor 3 for a bootstrap, the discharge transistor 4, the VDD power supply 5 and V1 and the drive pulse 6 of V2, and start pulse VST7. One [the capacity C1 for a bootstrap is charged in the plus direction of the VDD power supply 5 in start pulse VST7 of a signal transmission circuit inputting into the gate of the capacity charging transistor T11 for a bootstrap, and / the output transistor T12]. When V1 inputs into the drain of the output transistor T12 after that, in the gate of the output transistor T12. It will be impressed in the form where the potential difference of V1 potential and capacity C1 both ends for a bootstrap is added, and when potential under the gate of the output transistor T12 is made more greatly than V1, 12Vcontact N1 pulse can be outputted. This output is used as output OUT1 of a signal transmission circuit. One [simultaneously, the voltage of the point of contact N12 is impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step, and the capacity C2 for a bootstrap is charged, and / the output transistor T22].

[0003]When V2 inputs into the drain of the output transistor T22 after that, in the gate of the output transistor T22. It will be impressed in the form where the potential difference of V2 potential and capacity C2 both ends for a bootstrap is

added, and when potential under the gate of the output transistor T22 is made more greatly than V_2 , 22Vcontact N2 pulse can be outputted. This output is used as output OUT2 of a signal transmission circuit. One [simultaneously, the voltage of the point of contact N22 is impressed to the gate of the capacity charging transistor T31 for a bootstrap of the next step, and the capacity C3 for a bootstrap is charged, and / the output transistor T32]. At this time, simultaneously, the voltage of the point of contact N22 is applied to the discharge transistor T13 and the gate of T14, and the capacity C1 for a bootstrap of the preceding paragraph is discharged.

[0004]By such operation being repeated, a signal transmission circuit enables operations which take out an output one by one, such as OUT3 and OUT4.

[0005]

[Problem(s) to be Solved by the Invention]Drawing 4 is the conventional drive and output which used only NMOS. This circuit is a circuit of 5V system, and shows the case where the voltage swing of the drive pulse 6 of V1 and V2, the voltage swing of start pulse VST7, and all the VDD5 voltage are 5V.

[0006]Although it charges in the plus direction which is 5V of VDD5 and the capacity C1 for a bootstrap goes by the voltage 5V of start pulse VST7 inputting

into the gate of the capacity charging transistor T11 for a bootstrap at the time of the time t_0 , One [the influence of the threshold voltage V_t of T11 / C1 / only ΔH_0 becomes low voltage from 5V of VDD5, and / the output transistor T12] since the potential under the gate of T11 is not set to 5V when the capacity charging transistor T11 for a bootstrap is NMOS of an enhancement type. Next, when V1 inputs into the drain of the transistor T12 at the time of the time t_1 , in the gate of the output transistor T12. V1 potential and HB 1 voltage to which the potential difference ($5V - \Delta H_0$) of capacity C1 both ends for a bootstrap was added will be impressed, and the pulse of the amplitude of H1 will output to the point of contact N12. The capacity C2 for a bootstrap will be charged by ($H_1 - \Delta H_1$) in inputting the pulse amplitude H1 of the point of contact N12 into the gate of the capacity charging transistor T21 for a bootstrap of the next step.

[0007] Similarly, also in the time t_2 , t_3 , and t_4 , operation of the time t_1 will be repeated.

[0008] Since only the voltage below 5V is added to the gate of the capacity charging transistor 3 for a bootstrap at the maximum in the case of this circuit, the charge voltages of the capacity 2 for a bootstrap can charge only voltage lower than 5V of power supply VDD5. The potential of N21, N31, and N41

descends gradually, and an output stops therefore, in a signal transmission circuit coming out at several steps or the point.

[0009]Operation will become more difficult if it becomes the voltage lowering of the electrical power system of a circuit, for example, the circuit of 3V system, etc., especially.

[0010]

[Means for Solving the Problem]It is a drive method of a signal transmission circuit where a drive method of a signal transduction circuit of this invention comprises two or more unit circuits, and pulse voltage is outputted one by one from said unit circuit according to a drive pulse, An output transistor which said unit circuit inputs said drive pulse into a drain, and is outputted from source as said pulse voltage, Bootstrap capacity connected between a gate of said output transistor, and source, Source is connected to a gate of said output transistor in order to charge said bootstrap capacity, A drain is provided with a charging transistor connected to a power source wire, an earthing conductor, or a charge pulse line, A period when said pulse voltage has come out from source of said output transistor of a unit circuit (the N-2nd step unit circuit) of a beforehand stage of a unit circuit of eye N stage, When a charging transistor of each unit

circuit is an N type transistor, Drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of the preceding paragraph on a High level. When drain voltage of an output transistor of said N stage unit circuit is [a Low level and a charging transistor of each unit circuit] P type transistors, drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of said preceding paragraph A Low level, It is characterized by a drain of an output transistor of said N stage unit circuit being a High level.

[0011]By therefore, a thing for which potential of a gate of an output transistor connected to the plus side of capacity for a bootstrap is connected to a gate of a capacity charging transistor for a bootstrap of the next step. Voltage higher than before will be added to a gate of a capacity charging transistor for a bootstrap of the next step, and potential under a gate of a capacity charging transistor for a bootstrap can be made higher than VDD power supply voltage. VDD power supply voltage can be charged by this at capacity for a bootstrap of the next step, and descent of charge voltages to capacity can be prevented. And it can prevent that a fall and an output of an output of N21 by a transmission number of stages increasing, N31, and N41 stop coming out.

[0012]

[Embodiment of the Invention]Drawing 1 is a lineblock diagram of the signal transmission circuit in an embodiment of the invention. It is constituted by the output transistor 1, the capacity 2 for a bootstrap, the capacity charging transistor 3 for a bootstrap, the discharge transistor 4, the drive pulse 6 of V1, V2, and V3, and start pulse VST7. One [that start pulse VST7 of a signal transmission circuit inputs into the gate of the capacity charging transistor T11 for a bootstrap / the capacity C1 for a bootstrap is charged in a plus direction, and / the output transistor T12]. Then, when V1 inputs into the drain of the output transistor T12, in the gate of the output transistor T12. It will be impressed in the form where the potential difference of V1 potential and capacity C1 both ends for a bootstrap is added, and when potential under the gate of the output transistor 12 is made more greatly than V1, 12Vcontact N1 pulse can be outputted. This output is used as output OUT1 of a signal transmission circuit.

[0013]Since the voltage of the point of contact N11 especially whose advantage of this circuit is a terminal by the side of plus of the capacity C1 for a bootstrap is impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step, High voltage can be impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step. Therefore, even if the

capacity charging transistor T21 for a bootstrap of the next step is NMOS of an enhancement type, it will be one [the capacity / the capacity C2 for a bootstrap can charge VDD power supply voltage certainly, and / the output transistor T22].

[0014]Then, when V2 inputs into the drain of the output transistor T22, in the gate of the output transistor T22. It will be impressed in the form where the potential difference of V2 potential and capacity C2 both ends for a bootstrap is added, potential under the gate of the output transistor T22 is made more greatly than V2, and 22Vcontact N2 pulse can be outputted now. This output is used as output OUT2 of a signal transmission circuit.

[0015]One [the voltage of the point of contact N21 which is a terminal by the side of plus of the capacity C2 for a bootstrap is simultaneously impressed to the gate of the capacity charging transistor T31 for a bootstrap of the next step, and the capacity C3 for a bootstrap is certainly charged by VDD power supply voltage, and / the output transistor T32].

[0016]Thus, in order to add the terminal voltage by the side of plus of the capacity 2 for a bootstrap to the gate of the capacity charging transistor 3 for a bootstrap of the next step in all the signal-transmission stages, The signal transmission circuit of the low voltage and low power consumption which can

charge the capacity for a bootstrap of the next step certainly at VDD power supply voltage, and do not have a voltage drop is realizable.

[0017]In this circuit, while the drain voltage V1 of the output transistor T12 has appeared in output OUT1 as mentioned above, One [the capacity charging transistor T31 for a bootstrap] when the threshold voltage of T31 is low since the capacity C2 for a bootstrap of the next step is charged by 3V of the drain voltage VDD of the capacity charging transistor T21 for a bootstrap. One of the capacity charging transistor T31 for a bootstrap will charge the capacity C3 for a bootstrap in the positive voltage direction of VDD power supply voltage. If the capacity C3 for a bootstrap charges, and since there is possibility of malfunction that a part of drain voltage V1 of the output transistor T32 appears in output OUT3, it is necessary to use V3 pulse as a Low level. [the output transistor T32]

[0018]If the Low level of V3 pulse is especially set to 0V at this time, the number of input voltage from the element outside can be reduced, and reduction of circuit structure will also be stabilized by the ability to do.

[0019]Therefore, what is necessary is just to use one pulse of the drain of the output transistor related to output OUT3 of the stage after another as a Low level to output OUT1 needed in a signal transmission circuit. Similarly, in a signal

transmission circuit, if the pulse of the drain of the previous output transistor related to the output of the stage (the N+2nd step) one after another is used as a Low level from the output while the output of eye N stage needed has come out, malfunction of (the N+2nd step) of output of a signal transmission circuit can be prevented.

[0020] Since there should just be three kinds of pulses in order to realize such a means and to lessen the kind of drain pulse of an output transistor most, the case where the drain pulse of an output transistor performs a three-phase drive can lessen a drive circuit most.

[0021] As a means to discharge the voltage which charged the capacity 2 for a bootstrap, Consider it as the method of lessening the transistor and power supply of a circuit, and, in the case of the capacity C1 for a bootstrap, the source side of the discharge transistor T13 is connected to the plus side of the capacity C1 for a bootstrap, By connecting the source side of the discharge transistor T14 to the minus side of the capacity C1 for a bootstrap, and connecting the point of contact N22 by the side of the source of a next step output transistor to the discharge transistor T13 and the gate of T14. When 22Vcontact N2 pulse is outputted, the capacity C1 for a bootstrap is discharged.

[0022]By this composition, discharge is possible only by adding two discharge transistors, and a signal transmission circuit can be realized by the small circuitry of a scale without other external input pulses.

[0023]Drawing 2 is the drive and output in the embodiment of the invention which used only NMOS. The voltage swing and VDD power supply voltage of the drive pulse 6 of V1, V2, and V3 are 3V, and this circuit shows the case where the voltage swing of start pulse VST7 is 5V.

[0024]Since the terminal voltage by the side of plus of the capacity C11 for a bootstrap cannot be supplied only when it is the capacity charging transistor T11 for a bootstrap which start pulse VST7 inputs if drawing 1 is seen, The capacity C1 for a bootstrap can be charged 3V of VDD power supply voltage by driving only start pulse VST7 by 5V of voltage higher than the driver voltage of V1 and V2. Therefore, the voltage drop in the input transistor of start pulse VST7 can be prevented by making voltage of start pulse VST7 higher than the driver voltage of V1 and V2.

[0025]At the time of the time t_0 , the voltage of start pulse VST7 impressed 5V so that the voltage under the gate of T11 might become more than 3V, even when there was the threshold voltage V_t of the capacity charging transistor T11 for a

bootstrap which is NMOS of an enhancement type. The capacity C1 for a bootstrap is charged now by 3V of VDD power supply voltage.

[0026]Next, when V1 inputs into the drain of the output transistor T12 at the time of the time t1, in the gate of the output transistor T12. Since HB 1 voltage which is the V1 potential 3V and the high voltage to which the potential difference 3V of capacity C1 both ends for a bootstrap was added is impressed, V1 pulse of 3V amplitude will output to the point of contact N12 certainly. The capacity C2 for a bootstrap will be certainly charged by 3V of VDD power supply voltage in inputting into the gate of the capacity charging transistor T21 for a bootstrap of the next step pulse HB 1 of the point of contact N11 which is a terminal by the side of plus of the capacity C1 for a bootstrap. Since the capacity C3 for a bootstrap is charged by plus in the voltage of the capacity C2 for a bootstrap inputting into the gate of the capacity charging transistor T31 for a bootstrap of the stage one after another at this time, The Low level of V3 is set to 0V so that the malfunction out of which an output comes to OUT3 may be prevented.

[0027]Similarly, also in the time t2, t3, and t4, operation of the time t1 will be repeated. In the case of this figure, at the time t1, V1 is [V3] Low in High, and V2 at the time t2 by High. V1 is Low, at the time t3, V2 is Low in High, V3 is the

same as the time t_1 in the time t_4 , and, in V1, V3 has prevented malfunction as Low by High.

[0028]. Thus, in the case of this embodiment, since the terminal voltage by the side of plus of the capacity 2 for a bootstrap is always added to the gate of the capacity charging transistor 3 for a bootstrap of the next step, the capacity for a bootstrap of the next step can be charged certainly 3V, and there is no voltage drop. The signal transmission circuit of low power consumption is realizable by the low voltage of 3V.

[0029]In the above-mentioned embodiment, although the case of the transistor of N-channel MOS was shown, the same effect can be altogether acquired also about the case of P-channel MOS.

[0030]

[Effect of the Invention]As explained above, in the drive method of the signal transmission circuit of this invention. By connecting with the gate of the capacity charging transistor for a bootstrap of the next step, the potential of the gate of the output transistor to which the plus side of the capacity for a bootstrap was connected. Voltage higher than before will be added to the gate of the capacity charging transistor for a bootstrap of the next step, and potential under the gate

of the capacity charging transistor for a bootstrap can be made higher than the drain voltage of the capacity charging transistor for a bootstrap. The drain voltage of the capacity charging transistor for a bootstrap of the next step can be charged certainly by this at the capacity for a bootstrap of the next step, and descent of the charge voltages to capacity can be prevented. Therefore, it can prevent that the fall and output of an output by a transmission number of stages increasing stop coming out, and a low voltage drive can be realized.

[0031]While malfunction of a circuit can be prevented in operating drain voltage by the pulse of a three-phase drive, the number of drive pulses can be lessened most.

[0032]Meeting the request of a liquid crystal display and MOS type pickup device low voltage drive realization, the drive method of the signal transmission circuit of this invention uses a signal transmission circuit for a shift register, realizes voltage lowering, and is very useful industrially.

TECHNICAL FIELD

[Field of the Invention]This invention is used for the shift register for driving a liquid crystal display and an MOS type pickup device, and relates to the drive method of the signal transmission circuit which can be driven with the low voltage and low power consumption.

PRIOR ART

[Description of the Prior Art]Drawing 3 is an example which shows the composition of the conventional signal transmission circuit. It is constituted by the output transistor 1, the capacity 2 for a bootstrap, the capacity charging transistor 3 for a bootstrap, the discharge transistor 4, the VDD power supply 5 and V1 and the drive pulse 6 of V2, and start pulse VST7. One [the capacity C1 for a bootstrap is charged in the plus direction of the VDD power supply 5 in start pulse VST7 of a signal transmission circuit inputting into the gate of the capacity charging transistor T11 for a bootstrap, and / the output transistor T12]. When V1 inputs into the drain of the output transistor T12 after that, in the gate of the output transistor T12. It will be impressed in the form where the potential difference of V1 potential and capacity C1 both ends for a bootstrap is added,

and when potential under the gate of the output transistor T12 is made more greatly than V1, 12Vcontact N1 pulse can be outputted. This output is used as output OUT1 of a signal transmission circuit. One [simultaneously, the voltage of the point of contact N12 is impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step, and the capacity C2 for a bootstrap is charged, and / the output transistor T22].

[0003]When V2 inputs into the drain of the output transistor T22 after that, in the gate of the output transistor T22. It will be impressed in the form where the potential difference of V2 potential and capacity C2 both ends for a bootstrap is added, and when potential under the gate of the output transistor T22 is made more greatly than V2, 22Vcontact N2 pulse can be outputted. This output is used as output OUT2 of a signal transmission circuit. One [simultaneously, the voltage of the point of contact N22 is impressed to the gate of the capacity charging transistor T31 for a bootstrap of the next step, and the capacity C3 for a bootstrap is charged, and / the output transistor T32]. At this time, simultaneously, the voltage of the point of contact N22 is applied to the discharge transistor T13 and the gate of T14, and the capacity C1 for a bootstrap of the preceding paragraph is discharged.

[0004]By such operation being repeated, a signal transmission circuit enables operations which take out an output one by one, such as OUT3 and OUT4.

EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, in the drive method of the signal transmission circuit of this invention. By connecting with the gate of the capacity charging transistor for a bootstrap of the next step, the potential of the gate of the output transistor to which the plus side of the capacity for a bootstrap was connected. Voltage higher than before will be added to the gate of the capacity charging transistor for a bootstrap of the next step, and potential under the gate of the capacity charging transistor for a bootstrap can be made higher than the drain voltage of the capacity charging transistor for a bootstrap. The drain voltage of the capacity charging transistor for a bootstrap of the next step can be charged certainly by this at the capacity for a bootstrap of the next step, and descent of the charge voltages to capacity can be prevented. Therefore, it can prevent that the fall and output of an output by a transmission number of stages increasing stop coming out, and a low voltage drive can be realized.

[0031]While malfunction of a circuit can be prevented in operating drain voltage by the pulse of a three-phase drive, the number of drive pulses can be lessened most.

[0032]Meeting the request of a liquid crystal display and MOS type pickup device low voltage drive realization, the drive method of the signal transmission circuit of this invention uses a signal transmission circuit for a shift register, realizes voltage lowering, and is very useful industrially.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Drawing 4 is the conventional drive and output which used only NMOS. This circuit is a circuit of 5V system, and shows the case where the voltage swing of the drive pulse 6 of V1 and V2, the voltage swing of start pulse VST7, and all the VDD5 voltage are 5V.

[0006]Although it charges in the plus direction which is 5V of VDD5 and the capacity C1 for a bootstrap goes by the voltage 5V of start pulse VST7 inputting into the gate of the capacity charging transistor T11 for a bootstrap at the time of the time t0, One [the influence of the threshold voltage Vt of T11 / C1 / only

ΔH_0 becomes low voltage from 5V of V_{DD5} , and / the output transistor T12]
 since the potential under the gate of T11 is not set to 5V when the capacity
 charging transistor T11 for a bootstrap is NMOS of an enhancement type. Next,
 when V1 inputs into the drain of the transistor T12 at the time of the time t1, in
 the gate of the output transistor T12. V1 potential and HB 1 voltage to which the
 potential difference ($5V - \Delta H_0$) of capacity C1 both ends for a bootstrap was
 added will be impressed, and the pulse of the amplitude of H1 will output to the
 point of contact N12. The capacity C2 for a bootstrap will be charged by
 ($H_1 - \Delta H_1$) in inputting the pulse amplitude H1 of the point of contact N12 into
 the gate of the capacity charging transistor T21 for a bootstrap of the next step.
 [0007] Similarly, also in the time t2, t3, and t4, operation of the time t1 will be
 repeated.

[0008] Since only the voltage below 5V is added to the gate of the capacity
 charging transistor 3 for a bootstrap at the maximum in the case of this circuit,
 the charge voltages of the capacity 2 for a bootstrap can charge only voltage
 lower than 5V of power supply V_{DD5} . The potential of N21, N31, and N41
 descends gradually, and an output stops therefore, in a signal transmission
 circuit coming out at several steps or the point.

[0009]Operation will become more difficult if it becomes the voltage lowering of the electrical power system of a circuit, for example, the circuit of 3V system, etc., especially.

MEANS

[Means for Solving the Problem]It is a drive method of a signal transmission circuit where a drive method of a signal transduction circuit of this invention comprises two or more unit circuits, and pulse voltage is outputted one by one from said unit circuit according to a drive pulse, An output transistor which said unit circuit inputs said drive pulse into a drain, and is outputted from source as said pulse voltage, Bootstrap capacity connected between a gate of said output transistor, and source, Source is connected to a gate of said output transistor in order to charge said bootstrap capacity, A drain is provided with a charging transistor connected to a power source wire, an earthing conductor, or a charge pulse line, A period when said pulse voltage has come out from source of said output transistor of a unit circuit (the N-2nd step unit circuit) of a beforehand stage of a unit circuit of eye N stage, When a charging transistor of each unit

circuit is an N type transistor, Drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of the preceding paragraph on a High level. When drain voltage of an output transistor of said N stage unit circuit is [a Low level and a charging transistor of each unit circuit] P type transistors, drain voltage of an output transistor of a unit circuit (the N-1st step unit circuit) of said preceding paragraph A Low level, It is characterized by a drain of an output transistor of said N stage unit circuit being a High level.

[0011]By therefore, a thing for which potential of a gate of an output transistor connected to the plus side of capacity for a bootstrap is connected to a gate of a capacity charging transistor for a bootstrap of the next step. Voltage higher than before will be added to a gate of a capacity charging transistor for a bootstrap of the next step, and potential under a gate of a capacity charging transistor for a bootstrap can be made higher than VDD power supply voltage. VDD power supply voltage can be charged by this at capacity for a bootstrap of the next step, and descent of charge voltages to capacity can be prevented. And it can prevent that a fall and an output of an output of N21 by a transmission number of stages increasing, N31, and N41 stop coming out.

[0012]

[Embodiment of the Invention]Drawing 1 is a lineblock diagram of the signal transmission circuit in an embodiment of the invention. It is constituted by the output transistor 1, the capacity 2 for a bootstrap, the capacity charging transistor 3 for a bootstrap, the discharge transistor 4, the drive pulse 6 of V1, V2, and V3, and start pulse VST7. One [that start pulse VST7 of a signal transmission circuit inputs into the gate of the capacity charging transistor T11 for a bootstrap / the capacity C1 for a bootstrap is charged in a plus direction, and / the output transistor T12]. Then, when V1 inputs into the drain of the output transistor T12, in the gate of the output transistor T12. It will be impressed in the form where the potential difference of V1 potential and capacity C1 both ends for a bootstrap is added, and when potential under the gate of the output transistor 12 is made more greatly than V1, 12Vcontact N1 pulse can be outputted. This output is used as output OUT1 of a signal transmission circuit.

[0013]Since the voltage of the point of contact N11 especially whose advantage of this circuit is a terminal by the side of plus of the capacity C1 for a bootstrap is impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step, High voltage can be impressed to the gate of the capacity charging transistor T21 for a bootstrap of the next step. Therefore, even if the

capacity charging transistor T21 for a bootstrap of the next step is NMOS of an enhancement type, it will be one [the capacity / the capacity C2 for a bootstrap can charge VDD power supply voltage certainly, and / the output transistor T22].

[0014]Then, when V2 inputs into the drain of the output transistor T22, in the gate of the output transistor T22. It will be impressed in the form where the potential difference of V2 potential and capacity C2 both ends for a bootstrap is added, potential under the gate of the output transistor T22 is made more greatly than V2, and 22Vcontact N2 pulse can be outputted now. This output is used as output OUT2 of a signal transmission circuit.

[0015]One [the voltage of the point of contact N21 which is a terminal by the side of plus of the capacity C2 for a bootstrap is simultaneously impressed to the gate of the capacity charging transistor T31 for a bootstrap of the next step, and the capacity C3 for a bootstrap is certainly charged by VDD power supply voltage, and / the output transistor T32].

[0016]Thus, in order to add the terminal voltage by the side of plus of the capacity 2 for a bootstrap to the gate of the capacity charging transistor 3 for a bootstrap of the next step in all the signal-transmission stages, The signal transmission circuit of the low voltage and low power consumption which can

charge the capacity for a bootstrap of the next step certainly at VDD power supply voltage, and do not have a voltage drop is realizable.

[0017]In this circuit, while the drain voltage V1 of the output transistor T12 has appeared in output OUT1 as mentioned above, One [the capacity charging transistor T31 for a bootstrap] when the threshold voltage of T31 is low since the capacity C2 for a bootstrap of the next step is charged by 3V of the drain voltage VDD of the capacity charging transistor T21 for a bootstrap. One of the capacity charging transistor T31 for a bootstrap will charge the capacity C3 for a bootstrap in the positive voltage direction of VDD power supply voltage. If the capacity C3 for a bootstrap charges, and since there is possibility of malfunction that a part of drain voltage V1 of the output transistor T32 appears in output OUT3, it is necessary to use V3 pulse as a Low level. [the output transistor T32]

[0018]If the Low level of V3 pulse is especially set to 0V at this time, the number of input voltage from the element outside can be reduced, and reduction of circuit structure will also be stabilized by the ability to do.

[0019]Therefore, what is necessary is just to use one pulse of the drain of the output transistor related to output OUT3 of the stage after another as a Low level to output OUT1 needed in a signal transmission circuit. Similarly, in a signal

transmission circuit, if the pulse of the drain of the previous output transistor related to the output of the stage (the N+2nd step) one after another is used as a Low level from the output while the output of eye N stage needed has come out, malfunction of (the N+2nd step) of output of a signal transmission circuit can be prevented.

[0020] Since there should just be three kinds of pulses in order to realize such a means and to lessen the kind of drain pulse of an output transistor most, the case where the drain pulse of an output transistor performs a three-phase drive can lessen a drive circuit most.

[0021] As a means to discharge the voltage which charged the capacity 2 for a bootstrap, Consider it as the method of lessening the transistor and power supply of a circuit, and, in the case of the capacity C1 for a bootstrap, the source side of the discharge transistor T13 is connected to the plus side of the capacity C1 for a bootstrap, By connecting the source side of the discharge transistor T14 to the minus side of the capacity C1 for a bootstrap, and connecting the point of contact N22 by the side of the source of a next step output transistor to the discharge transistor T13 and the gate of T14. When 22V_{contact N2} pulse is outputted, the capacity C1 for a bootstrap is discharged.

[0022]By this composition, discharge is possible only by adding two discharge transistors, and a signal transmission circuit can be realized by the small circuitry of a scale without other external input pulses.

[0023]Drawing 2 is the drive and output in the embodiment of the invention which used only NMOS. The voltage swing and VDD power supply voltage of the drive pulse 6 of V1, V2, and V3 are 3V, and this circuit shows the case where the voltage swing of start pulse VST7 is 5V.

[0024]Since the terminal voltage by the side of plus of the capacity C11 for a bootstrap cannot be supplied only when it is the capacity charging transistor T11 for a bootstrap which start pulse VST7 inputs if drawing 1 is seen, The capacity C1 for a bootstrap can be charged 3V of VDD power supply voltage by driving only start pulse VST7 by 5V of voltage higher than the driver voltage of V1 and V2. Therefore, the voltage drop in the input transistor of start pulse VST7 can be prevented by making voltage of start pulse VST7 higher than the driver voltage of V1 and V2.

[0025]At the time of the time t_0 , the voltage of start pulse VST7 impressed 5V so that the voltage under the gate of T11 might become more than 3V, even when there was the threshold voltage V_t of the capacity charging transistor T11 for a

bootstrap which is NMOS of an enhancement type. The capacity C1 for a bootstrap is charged now by 3V of VDD power supply voltage.

[0026]Next, when V1 inputs into the drain of the output transistor T12 at the time of the time t1, in the gate of the output transistor T12. Since HB 1 voltage which is the V1 potential 3V and the high voltage to which the potential difference 3V of capacity C1 both ends for a bootstrap was added is impressed, V1 pulse of 3V amplitude will output to the point of contact N12 certainly. The capacity C2 for a bootstrap will be certainly charged by 3V of VDD power supply voltage in inputting into the gate of the capacity charging transistor T21 for a bootstrap of the next step pulse HB 1 of the point of contact N11 which is a terminal by the side of plus of the capacity C1 for a bootstrap. Since the capacity C3 for a bootstrap is charged by plus in the voltage of the capacity C2 for a bootstrap inputting into the gate of the capacity charging transistor T31 for a bootstrap of the stage one after another at this time, The Low level of V3 is set to 0V so that the malfunction out of which an output comes to OUT3 may be prevented.

[0027]Similarly, also in the time t2, t3, and t4, operation of the time t1 will be repeated. In the case of this figure, at the time t1, V1 is [V3] Low in High, and V2 at the time t2 by High. V1 is Low, at the time t3, V2 is Low in High, V3 is the

same as the time t_1 in the time t_4 , and, in V1, V3 has prevented malfunction as Low by High.

[0028]. Thus, in the case of this embodiment, since the terminal voltage by the side of plus of the capacity 2 for a bootstrap is always added to the gate of the capacity charging transistor 3 for a bootstrap of the next step, the capacity for a bootstrap of the next step can be charged certainly 3V, and there is no voltage drop. The signal transmission circuit of low power consumption is realizable by the low voltage of 3V.

[0029]In the above-mentioned embodiment, although the case of the transistor of N-channel MOS was shown, the same effect can be altogether acquired also about the case of P-channel MOS.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The figure showing the signal transmission circuit in an embodiment of the invention

[Drawing 2]The figure explaining the drive and output in an embodiment of the

invention

[Drawing 3] The figure showing the conventional signal transmission circuit

[Drawing 4] The figure explaining a conventional drive and output

[Description of Notations]

1 Output transistor

2 Capacity for a bootstrap

3 The capacity charging transistor for a bootstrap

4 Discharge transistor

5 VDD power supply

6 Drive pulse

7 Start pulse



